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China Report

ECONOMIC AFFAIRS

No. 115

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BRIEFS

HUBEI SAVINGS UP SHARPLY--According to banking statistics from Hubei, by mid-December of 1980 urban and rural savings balances showed an increase of 265 million yuan, up 89 percent over the same period in 1979. Savings among rural commune members throughout the province reached 350 million yuan, an increase of 140 million yuan over the same period in 1979, which is a net per capita increase among the rural population of 3.6 yuan. [Excerpt] [Hangzhou HUBEI RIBAO in Chinese 2 Jan 81 p 1]

YUNNAN MINORITY SAVINGS--The economic development and bank savings of the minority regions in Yunnan Province have increased dramatically. According to statistics from 80 autonomous prefectures, rural and urban savings were up 38.3 percent in 1980, as compared to the previous year. [Beijing RENMIN RIBAO in Chinese 16 Jan 81 p 1]

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ZHEJIANG POWER CONSERVATION PLAN PREFULFILLED

Hangzhou ZHEJIANG RIBAO in Chinese 30 Dec 80 p 1

[Article by ZHEJIANG RIBAO correspondent: "After a Successful Technical Innovation and Under More Active Leadership in Energy Control, Our Province Has Fulfilled State-Set Targets for Energy Conservation Ahead of Schedule"]

[Text] A mass movement for energy conservation is being launched throughout the province with notable results. Since the beginning of 1980, we have saved 470,000 tons of coal, 290 million units of electricity and 30,000 tons of ready-made oil and fuel oil equivalent to 730,000 tons of coal. The state-set targets for energy conservation were fulfilled ahead of schedule.

Strengthened management, particularly the management of large energy consumers, has been one of the important factors of success in energy conservation. There are altogether 220 enterprises known as large energy consumers. Once these enterprises are brought under control, energy conservation can be carried out in the same way an ox is led by the nose. For example, the Hangzhou Iron and Steel Plant annually consumed more than 450,000 tons of standard coal, which accounted for one-ninth of the total industrial coal consumption in the province. Its waste was indeed appalling. Through propaganda and education on the importance of energy conservation, the plant strengthened its leadership over energy conservation by setting up an energy conservation staff office, manned by energy engineers and under the personal supervision of the deputy plant director. Similar organizations have also been formed in various branch plants and workshops with specially appointed persons in charge. A system of scientific management was introduced and plans for balanced heat (electricity) generation have been worked out to reduce energy consumption each year. The overall consumption of energy on every ton of steel has dropped from 2.015 tons in 1979 to 1.046 tons of standard coal in 1980, and other comparable consumption has also been reduced from 1.304 to 1.142 tons. This plant has not only taken the lead among the small and medium-size iron and steel enterprises but also reached the advanced levels among the key enterprises throughout the country.

While strengthening energy control, all localities have at the same time attended to technical innovation and structural improvement with energy conservation as the core. Equipment is more efficiently used to save energy along with the

deepening of the energy conservation drive. Many localities have conducted general surveys and assessments of the energy consuming machines, tools, boilers and kilns, and classified them into different categories to be rebuilt, improved or salvaged. Some 40 percent of the coal in the province is consumed by boilers. Among more than 2,900 boilers, 44 percent are of the old types of the 1930's and 1940's, with an average heating efficiency rate of only less than 50 percent. These "big eaters" of coal and oil are being rebuilt in different batches in various localities. After rebuilding 200 low efficiency boilers in 19[illegible], the heat efficiency rate has been raised to above 50 percent with a saving of more than 60,000 tons of coal. Furthermore, after technical innovation in various localities, the residual heat, waste steam, combustible gas and the residual heat from high temperature smoke in industry can be recovered and reused. Since 1979, waste steam and residual heat equivalent to more than 190,000 tons of coal have been recovered and reused. All localities have also paid close attention to the popularization of advanced techniques which have proved to be effective in energy conservation, such as heating with ultra-violet rays, insulation with fire resistant fibers and oil saving vehicle carburetors. The Hangzhou Municipal Cotton Textile Bureau has popularized the use of ultra-violet rays and other new techniques, and in 9 months, saved 8.15 million watts of electricity.

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ENERGY

ZHEJIANG SETS RECORD IN POWER GENERATION

Hangzhou ZHEJIANG RIBAO in Chinese 27 Dec 80 p 1

[Article by ZHEJIANG RIBAO correspondent Wang De [3769 1795] and Yao Guoyi [1202 0943 4135]: "Increasing Resources and Curtailing Consumption, Zhejiang Sets Record in Power Generation and Makes Greater Contribution by Serving as Good Vanguard']

[Text] Increasing resources and curtailing consumption, the broad masses of workers and staff members on the electric power front of the province have produced more electricity and fulfilled the annual plan 2 months ahead of schedule. By the end of November, 7.048 billion units of hydro- and thermopower had been generated. This represents an increase of 42.3 percent over the same period in 1979 and sets a new record. All economic and technical indices were the highest in local history.

To alleviate the contradiction between power supply and demand, the provincial power system has in the past several years paid close attention to power capital construction and strived to increase the sources of electric power by installing more equipment as quickly as possible. Since September 1979, the following projects have been commissioned one after another and yielded important gains: Wuxijiang Power Plant with four 22,500 kw generating units; Zhenhai Power Generating Plant with a 125,000 kw generating unit; Dinghai Power Generating Plant with a 12,000 kw generating unit; and Wenzhou Meiyu Power Generating Plant with a 6,000 kw generating unit. From January to November, these units generated 1.1179 billion units of electricity, or 15.9 percent of the total generating capacity. The equipment of some of our power generating plants, particularly the thermopower plants, is quite old and the structure of the power grid is irrational, causing rather heavy losses. In view of this, the relevant units of the electric-power system have paid close attention to the even distribution of generating sets, the tapping of potentials and the transformation of equipment. They also strengthened their inspection and repair systems so as to minimize mechanical breakdowns and the need for makeshift repairs. The ratio of equipment is good condition was increased from 93.5 percent at the beginning of 1980 to 98.3 percent by the end of the same year, thus reducing the loss of power from equipment breakdowns. They also carried out technical innovation for saving coal and electricity. The power-generating plants directly affiliated with the provincial bureau have vigorously carried out technical innovation this year and energetically raised the ratio

of generating capacity by the high-temperature and high-pressure units with low coal consumption. At the same time, they popularized the use of coal-saving high pressure heaters and, from January to November, lowered coal consumption for each unit of electricity by 35 grams below the level of the same period in 1979. Thus they saved 109,000 tons of standard coal which can be used to generate more than 260 million units of electricity. In 1980, these directly affiliated plants also remodeled 17 sets of windmills and water pumps and saved 10 million units of electricity in their operation.

The rainfall in our province this year has been uneven, or not as even as it was in previous years. This brought about certain difficulties in the balanced generation of hydropower. The hydropower plants, however, defied these difficulties by closely observing the forecast of hydrology, making meticulous adjustments and strengthening their contacts with other departments. Besides insuring adequate water storage, they strived to generate as much electricity as they could during the rainy season as a contribution to power generation in the province.

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MINES, COMMUNES TEAM UP TO BUILD ENERGY BASE

Taiyuan SHANXI RIBAO in Chinese 24 Oct 80 p 2

[Article by SHANXI RIBAO correspondent Niu Gengtian [3662 5087 3944]: "Energy Base Set Up Through Joint Undertaking of Coal Mines and Communes and Production Brigades--Good Method for Strengthening Worker-Peasant Alliance Proposed by Secretary Li Jiajun [2621 1367 7486] of Jincheng Mining Administration Bureau"]

[Text] How can we reconcile the interests of both industry and agriculture and arouse their enthusiasm in setting up coal energy bases? This was what Secretary Li Jiajun recently told our correspondent: The solution of this problem lies in industrial-agricultural integration.

Li Jiajun said: The mining and utilization of coal resources have brought forth some problems. First, damages to the land surface and the cutoff or shortage of water supply convert the peasants' paddy fields into arid land besides creating difficulties for people and cattle in obtaining drinking water. Secondly, despite the large-scale removal of waste and slags and the building of surface structures, there is still a surplus of labor among the communes and production brigades. Thirdly, failure in the comprehensive utilization of the "three wastes" results in environmental pollution. We did not attach much importance to these problems in the past and failed to pay adequate attention to the peasants' interests with the result that the relationship between industry and agriculture became rather strained. There has never been any assurance of vegetable supply for the mining areas, and disputes frequently arose when the coal mines procured land from the communes and production brigades. Social conditions in the mines and the nearby communes were chaotic and there were frequent losses of property. The serious competition by communes and production brigades for water, electricity and other resources with the state-operated coal mines directly affected industrial and agricultural production and construction. The solution to these problems is to reconcile both industrial and agricultural interests, to arouse the enthusiasm of both parties and to take the road of integration.

Speaking of integration, Li Jiajun said: Its substance, duties and benefits can be spelled out in the contract when both parties have come to agreement in a joint undertaking. The projects of the joint undertaking should be based on realities of the coal mine and the communes and production brigades. At present, the main projects to be undertaken are as follows: The construction of a base for

the production and supply of nonstaple food for the mining areas, afforestation for the supply of mining pillars, contracted engineering jobs, machinery processing and so forth. The communes and production brigades should establish a good nonstaple food base for the mining areas and make careful arrangements for the planting of vegetables so as to insure the supply of nonstaple food for the mines and to solve the problem of vegetable dishes for the workers and staff members there. The coal mines should help the communes and production brigades solve the problem of water supply and other problems of technology and equipment. Afforestation for the supply of mining pillars can be financed by enterprise investments, while the communes and production brigades can supply barren mountains and the labor force in the joint undertaking. In awarding construction contracts, the enterprises should give priority to the nearby communes and production brigades in order to provide some outlet for the local surplus labor. In recruiting workers, the coal mine should also give due consideration for the local communes and production brigades. The labor service system can be adopted for coal extraction and tunneling. As an alternative, part of the labor force of the communes and production brigades can be employed on a contract basis. In this way, the problem of labor shortage in coal mining can be solved, while some outlet will be found for the surplus labor of these communes and production brigades. This joint undertaking will also help solve the problem of competition with state-operated coal mines for resources by some communes and production brigades which, failing to find any lucrative sideline occupation, had to open small coalpits thoughtlessly. Furthermore, the coal mine has to help the communes and production brigades develop their own enterprises and promote collective economy.

Li Jiajun said: There are many projects for a joint coal mine and commune and production brigade undertaking, and such an undertaking has very great potentials. Take the Jincheng Mining Administration Bureau for example: From 1977 to 1979, the bureau spent a total of more than 190,000 yuan on wage funds for setting up a mining pillar forest, and the number of extra workers each year exceeded 1,200, with a payroll of more than 1,717,000 yuan. If all these contracted jobs were given to the local communes and production brigades, these communes and production brigades should have no further financial worry. Furthermore, in recent years, this bureau paid a total amount of more than 460,000 yuan as compensation for damage to the land, and the communes and production brigades owed the bureau more than 227,000 yuan for the consumption of electricity. Should all these funds be used rationally in an overall arrangement, much better economic results can be gained. If industrial and agricultural interests are combined to serve a common purpose, the peasants will show greater concern for the mine construction, the workers will be more concerned for the production of the communes and production brigades, and the building of coal energy bases will gather new momentum.

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COAL CLASSIFICATION RESEARCH IN CHINA

Beijing MEITAN KEXUE JISHU [COAL MINING SCIENCE & TECHNOLOGY] in Chinese No 8, Aug 80 pp 15-22

[Article by Yang Jinhe [2799 6855 0735], deputy director; Chen Misheng [7115 1736 3922], deputy division chief; Tao Yuling [7118 3768 7227], Chen Peng [7115 7720], Chen Wenmin [7115 2429 2404], engineers of Beijing Coal Chemistry Institute of the Research Academy of Coal Mining Sciences; "Coal Classification Research in China"]

[Text] China is endowed with rich resources of various kinds of coal. Coal is not only one of the chief energy sources, but also an important raw material for the chemical industry. In pace with the rapid development of the national economy, there is an increasing demand among the consumers for coal both in quantity and quality with each passing day. In order to formulate appropriate plans for the overall distribution of the coal industry, supervise the exploration, exploitation and production of coal, and also to provide favorable conditions for the rational and comprehensive utilization of coal, it is necessary to come up with a scientific and reasonable classification of various sorts of coal.

The current coal classification in our country was recommended and ratified by the State Commission of Technology for trial implementation in April 1958. It has made positive contributions to the exploration, exploitation, production and utilization of coal for more than 20 years. However, there are still some problems to be solved. As the proposed classification was mainly intended for coking coals, and there was hardly any research on the classification of dry burning coals then, some coals could not be classified at all. For instance, it was obviously impossible to distinguish lignite from candle coal by volatile matter content on combustible basis $V^r > 40$ percent and noncaking property (Y=0). Owing to the unreasonable classification plan, there was a great disparity in the caking property of even the same group of coal (for example, gas coal). Due to the stringent standards required by the employment of the maximum thickness of colloidal laminae as a classification index, large quantities of coal samples had to be used for determination. Therefore, it is imperative to study and revise the current coal classification plan of China.

I. Classification of Lignitous Coals

1. The international lignite classification

A typical lignite is the kind of coal which has undergone diagenesis only, but no metamorphism at all.

According to the International Classification of Hard (bituminous) Coal and the industrial technical classification of lignite in the United States, the Soviet Union and other countries, the differentiation between lignite and bituminous coal, as well as the subdivision of lignite are based on such indices as V^f, high calorific value on moist-ash free basis, tar ratio (T^f) and total moist content on ash-free basis (W_Q^f). But none of the preceding indices have a universal line of division. The specific division line of each index for distinguishing lignite from bituminous coal is determined by each country in accordance with its own resources. For instance, V^f varies from 31, 33, 37, 40 to 42 percent.

In foreign countries, lignite is sometimes classified into earthy lignite, dark lignite and glossy lignite; or lignitous coal and wood coal; or brown coal and secondary coal based on macroscopic coal rock type and elementary composition. The preceding kinds of coal are not based on industrial technical classification. Instead, they are based on academic or genetic classification of lignite, which does not have much significance in practical use.

2. Selection of indices for lignite classification

In the research on coal classification, 163 samples of lignite, candle coal, non-caking coal and weak-caking coal were used for the determination of such indices as V^f, visual transmissibility (P^M), transmissibility of light at 475 mμ wavelength with 72-type spectrophotometer (P_{475}^{72}), the maximum internal moisture content (W_{CM}^f), carbon content of (C^f), oxygen content (O^f), the high calorific capacity on ash-free basis at maximum internal moisture content (Q_{CM}^{f-CM}), the high calorific capacity on combustible basis (Q_{CM}^f), tar ratio on combustible basis (T^f), total humic acids on combustible basis (HA^f), as well as for the determination of such coal petrological parameters as the mean maximum reflectivity (R^o_{max}) and microhardness (Hv) of specular coal.

A correlation analysis of the indices was conducted on the basis of the results in determining 114 samples of lignite and candle coal. The correlation coefficients are shown in Table 1. In the computation of each sample, all the indices had specific values; but due to the lack of specific values whenever $P^M < 30$ percent and > 90 percent, P_{475}^{72} was then used as transmissibility in computation. The result of correlation analysis between the P^M and P_{475}^{72} values of 81 coal samples indicated that the correlation coefficient (r) between P_{475}^{72} and P^M was equal to 0.9938, i.e. $r=0.9938$ when transmissibility P_{475}^{72} was measured in the same lab with the same 72-type spectrophotometer and transmissibility P^M was measured by visual colorimetry. Moreover, the regression equation was $P_{475}^{72} = -23.67 + 1.33\ P^M$, of which the relationgraph was almost an ideal straight line. The regression equation allowed us to make conversions, e.g., $P_{475}^{72} = 64$ percent when $P^M = 66$ percent, and $P_{475}^{72} = 16.2$ percent when $P^M = 30$ percent.

Table 1. Correlation Coefficients (r) Between the Indices of Lignite and Candle Coal; Matrix n = 114

Indices	A^d (percent)	W^{-A}_{GR} (percent)	$(C/O)_{raw}$	$(C/H)_{raw}$	V^f (percent)	$Q^{-A.GR}_{GR}$ (cal/g)	[illegible] (percent)	R_v (kg/mm^2)	P^{72}_{436} (percent)	C^f (percent)	Q^f_{GR} (cal/g)
A^d (percent)	1.0000	0.8208	0.9515	0.4654	-0.3550	-0.8897	-0.7663	-0.1122	-0.9274	-0.9616	-0.9639
W^{-A}_{GR} (percent)		1.0000	0.7731	0.4113	0.6112	-0.9526	-0.7531	-0.3925	-0.7905	-0.8155	-0.8257
$(C/O)_{raw}$			1.0000	0.4148	-0.5621	0.8448	0.7399	0.1477	0.8996	0.8879	0.8941
$(C/H)_{raw}$				1.0000	-0.8556	0.3959	0.4982	0.2424	0.4862	0.6121	0.3677
V^f (percent)					1.0000	-0.3182	-0.6666	-0.2865	-0.6330	-0.7626	-0.5484
$Q^{-A.GR}_{GR}$ (cal/g)						1.0000	0.7839	0.2833	0.8660	0.8751	0.9150
[illegible] (percent)							1.0000	0.2671	0.7868	0.7800	0.7591
R_v (kg/mm^2)								1.0000	0.0703	0.3451	0.0965
P^{72}_{436} (percent)									1.0000	0.9138	0.9124
C^f (percent)										1.0000	0.9335
Q^f_{GR} (cal/g)											1.0000

From Table 1, it can be seen that the correlations between $P_{\%}^{72}$ and C^r, O^r, Q_{GW}^r, Q_{GW}^{-A-GN} and $(C/O)_{raw}$ are fairly good; their respective correlation coefficients are: 0.9138, -0.9279, 0.9124, 0.8660 and 0.8996.

While C^r is regarded in some foreign reference materials as the best index for qualifying the coalification grade of young coal, our research results show that P^M, ($P_{\%}^{72}$), C^r, O^r, Q_{GW}^r, Q_{GW}^{-A-GN} and $(C/O)_{raw}$ are better indices for qualifying the coalification grade of young coal. In addition, the correlation between these indices and V^r is poor. The correlation coefficients range from 0.63 to 0.76, which shows that V^r can only qualify the coalification grade of young coal to a certain extent. Thus, it is not suitable to solely rely on V^r in distinguishing lignite, candle coal and other young coals. Besides V^r, it is necessary to choose another index to qualify coalification grade.

The merits and demerits of various indices should be taken into account when selecting classification indices as discussed below:

(1) The fairly good correlation between transmissibilities P^M, $P_{\%}^{72}$ and C^r, O^r shows that they are related to the textures and oxygen-bearing functional groups of young coals, and are thus excellent indices for qualifying the coalification grades of young coals. The method of measuring transmissibility is quite simple, gives reliable results which has excellent reproducibility. Moreover, the results are not affected when the coal samples are slightly oxidated. The shortcoming of such indices lies in the fact that the measurement results change when the instruments are switched if a spectrophotometer is used for determining the transmissibility. P^M is comparatively stable and reliable; its weakness lies in the fact that with the visual colorimetry method, no concrete values can be obtained when it is < 30 percent and > 90 percent, which, however, has no influence on its applicability.

(2) C^r is one of the indices obtained through coal elementary analysis. The measurement results are fairly accurate and reliable, and can denote the coalification grade of young coal. Thus, C^r is also a good index for the classification of young coals. The drawback of this index lies in the pronounced deviation of C^r towards the lower end in high sulphur coals.

(3) The indices of calorific capacity, such as Q_{GW}^{-A-GN} and Q_{GW}^r, can also reflect the degree of coalification quite satisfactorily (but not as good as transmissibility or C^r). Based on the results of integrated tests conducted by all the chemical labs in China, its weakness lies in the relatively great errors which result from the determination of the calorific capacity of coal (especially young coal), and the influence of the sulphur content of coal over the measurement results.

(4) W_{GN}^{-A} correlates quite well with Q_{GW}^{-A-GN}, and also correlates comparatively well with $P_{\%}^{72}$ and C^r. As a classification index, it is far better than total moisture, although the latter is commonly used in foreign countries. Its weak point lies in the relatively great discrepancy of measurements by various labs.

(5) In coal petrology, the maximum mean reflectivity of specular coal R^{o}_{max} correlates well with C^r, $P_M^{75}\%$, Q_{GW}^{A-GN}, W_{GN}^{A} and Q_{GW}^{r}; the correlation coefficients are 0.7801, 0.7868, 0.7839, -0.7530 and 0.7591 respectively. The value of R^{o}_{max} at the division between lignite and candle coal is approximately 0.50, which coincides with research results in foreign labs.

(6) There is no universal division line for the classification of lignite in foreign countries. In the current coal classification system of China, the lower limit of V^r for lignite and candle coal are > 40 percent and > 37 percent respectively. Actually, in our country's coal resources, there is quite a proportion of lignite with V^r ranging from 37 to 40 percent, and P^M < 66 percent. Thus, the lower limit of V^r should be modified accordingly. In the current coal classification plan, the upper limit of V^r for noncaking coal and weak-caking coal is 37 percent. Based on in-depth research on the V^r and P^M of lignite, candle coal, noncaking coal and weak-caking coal, as well as coal resources, it is believed that V^r = 37 percent should be used as a line of division for distinguishing lignite and candle coal from noncaking coal and weak-caking coal. Furthermore, P^M can be used for differentiating candle coal from lignite, and also for subdividing lignite (see Table 2 and Figure 1).

Table 2. Classification of Lignite and Candle Coal (Draft)

Name	Symbol	V^r (percent)	P^M (percent)	Remarks
candle coal	CY	>37	>66	Further division between candle coal and gas coal is based on caking property index.
No 2 lignite	HM_2	>37	≤66 30	
No 1 lignite	HM_1	>37	<30	
noncaking coal	BN	≤37		Division between BN and RN is based on caking property index.
weak-caking coal	RN	≤		

As coal is a complicated solid combustible mineral deposit, its properties are formed through gradual transformations, especially from lignite to candle coal stage. Moreover, the properties of coal are decided by the degree of coalification as well as other factors such as coal rock composition. In order to verify the reliability of P^M as a classification index, we chose the results of 108 coal analysis samples and ran Q-type cluster analysis tests on the computer with 8 indices, i.e. $P_M^{75}\%$, C^r, V^r, Q_{GW}^{A-GN}, Q_{GW}^{r}, W_{GN}^{A}, R^{o}_{max} and Hv. Based on the statistic of certain similarities, the Q-type cluster analysis gave a quantitative description of the relationship among the various coal samples. Based on their degree of relationship (degree of similarity), the coal samples were divided into different classes (groups). In the computation, the distance coefficient d was chosen as the statistic of similarities. Taking V as the number of determined variables (i.e., the number of items determined through analysis) in the samples, the distance in V-dimensional space between the i-th and k-th coal samples was computed as follows:

$$d_{i,k} = \sqrt{\frac{\sum_{j=1}^{V} (X_{ij} - X_{kj})^2}{V}}$$

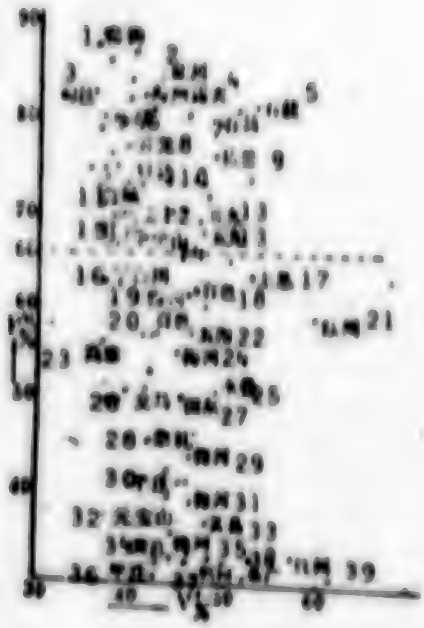

Figure 1. $P^M - V^r$ Indices Relationship Graph

▲ - Chemical test result of each ore point (represents only the sampling point of each mine)

Key:

(1) Yaojie
(2) Fuchuan
(3) Xunyi
(4) Haizhou Open-pit
(5) Shigu
(6) Huating
(7) Shigu
(8) Wulong
(9) Yilan
(10) Yianbian
(11) Yingcheng
(12) Wusu
(13) Wujiu
(14) Daming
(15) Heishan
(16) Hantaichuan
(17) Shangsi
(18) Baise
(19) Meihe
(20) Baise
(21) Qinzhou
(22) Wutu
(23) Gaoyao
(24) Meihe
(25) Yongdeng
(26) Yima
(27) Tiandong
(28) Chongli
(29) Meihe
(30) Pingzhuang
(31) Meihe
(32) Yuanbaoshan
(33) Huangxian
(34) Huangxian
(35) Meihe
(36) Pingzhuang
(37) Xinzhou
(38) Fengguang
(39) Qinzhou

$i, k = 1,2,3,\ldots\ldots,N, \quad i \neq k$

in which x_{ij} -- the measured values of the i-th sample and the k-th variable;

N -- number of coal samples, $N = 108$;

V -- number of variables, $V = 8$.

The results of cluster analysis were directly obtained from the computer in the form of an output (2-dimensional genealogical) tree chart which vividly showed the similarities among the various coal samples in terms of distance coefficient. According to the results of the cluster analysis, the coals were classified into three classes: candle coal, lignite No 1 and lignite No 2. An overwhelming majority of the results coincided with those based on P^M classification, and the rate of consistency reached 87 percent. Thus, we believe that the classification plan based on P^M index as shown in Table 2 is reliable.

II. Classification of Anthracite

V^r is used as the index for classification in both the International Classification of Hard Coals and the classification systems employed in the United Kingdom, the United States, France, West Germany, Italy and other countries (the Americans and Japanese also use fixed carbon on water-free/mineral-free basis or water-free/ash-free basis). In addition, the V_T^r index--volatile matter on combustible basis--is used on Donbas, USSR, and V^r is sometimes replaced by H^r in the United Kingdom. The differentiation between anthracite and bituminous coal is based on $V^r \leq 10$ percent in some places, while others prefer to use $V^r = 9$, 8 or 7 per cent as the line of division. Anthracite is further subdivided in the International Classification of Hard Coal, and the classification systems in the United Kingdom, the United States, Italy, Poland, Japan and the Soviet Union (Donbas) as well. In the subdivisions, a comparatively narrow upper limit is generally assigned to anthracite (e.g., $V^r = 7$, 8, 9 percent), but there is a subgroup called semi-anthracite (sometimes known as anthracitous coal class) between anthracite and bitumite of the highest metamorphic grade. From above, it can be seen that the reason why most anthracite classification systems in foreign countries are based on V^r index lies in the great extent to which V^r can qualify the degree of coal metamorphism. When coal is in the anthracitous stage, there are some other technological properties which depend mainly on metamorphic grade. Thus, in selecting classification indices, it is most essential to consider which ones can best qualify the degree of metamorphism. Some classification index, which is used for classifying bituminous coal. But, in the anthracitous stage, coals do not have caking property. Thus, caking property cannot serve as a characteristic index for anthracite classification at all. The fact that V^r can largely qualify the degree of metamorphism in the anthracitous stage does not necessarily mean that it is the best index for qualifying metamorphic grade. While some foreign researchers believe that V_T^r is the best index for qualifying the metamorphic grade of anthracite, others prefer H^r, and there are also some who would rather use the maximum mean reflectivity of specular coal as the index. Where does the division line between anthracite and meagre coal fall?

Besides selecting classification indices, it is also necessary to take into consideration the specific conditions of anthracitous and meagre coal resources in each country so as to be able to determine whether or not to subdivide anthracite on the basis of anthracitous resources of varying metamorphic degrees, as well as industrial requirements for exploitation of the anthracitous resources.

In China's current system of coal classification, the main problem encountered in the classification of anthracite lies in the inadequate basis for setting $V^r \leq 10$ percent as the line of division between anthracite and bituminous coal. Moreover, the coal cleaning/separation method of using zinc chloride solution of 1.4 specific gravity is very unsuitable for the classification of anthracite.

1. Unifying the cleaning/separation method for anthracite: The density of coal undergoes remarkable changes when its metamorphic grade reaches the anthracitous stage. According to research results, the density (d_{ch}) of pure coal (ash-free/water-free coal) changes within the range of 1.34 to 1.90. Thus, instead of mechanically applying the bituminous coal separation method, the heavy solution separation method should be used for anthracite (separation solution of 1.4 specific gravity). But how to determine the specific gravity of cleaned and separated anthracite? Based on the conclusion that the computation results for raw coal and cleaned coal coincide with each other when the calculations are based on the empirical formula for pure coal specific gravity, i.e., $d_{ch} = d^g - 0.01 A^g$, it is suggested that separation methods for different specific gravities are to be used in accordance with the different real specific gravities of pure coal. In another experiment, the test data of 100 coal samples have helped verify the validity of the preceding conclusion. After determining the real specific gravities and ash contents of the 100 coal samples, the results were used to compute the real specific gravities of pure coals, the differences between raw coal d_{ch} and cleaned coal d_{ch}, as well as their mean values and standard differences. After discarding three numerical values which were somewhat inconsistent due to accidental errors, the mean values and standard differences were computed once again. From 97 coal samples, it was found that d_{ch} (raw coal) - d_{ch} (cleaned coal) = mean difference of d_{ch}, $\bar{d}_{ch}$ difference = 0.007, and the standard difference of the d_{ch} difference was $\bar{S} = 0.02549$.

$$t = \frac{\Delta\bar{d}_{ch} - 0}{S \cdot \sqrt{n}} = \frac{0.0070 - 0}{0.02549 \cdot \sqrt{97}}$$

$$= 2.7047$$

When the degree of freedom = 96 and the degree of reliability = 0.005, $t_{0.005}$ = 2.872. Neither of them had any clearcut gaps, i.e., the range of reliability = $0.0070 \pm t_{0.005} \times 0.02549$, which falls within the range of -0.066 to + 0.080. So, it is feasible to subtract the ash contents in accordance with this method.

2. The relationship among various indices pertaining to the classification of anthracite, and the selection of classification index: A correlation analysis was conducted on potential indices for anthracite classification, such as

Table 3. Correlation Coefficients (r) Among Indices of Anthracite and Meagre Coal; Matrix n = 127

Indices	V^r (per-cent)	C^r (per-cent)	H^r (per-cent)	V_T^r (ml/g)	H_v (kg/mm^2)	$\bar{R}_{max}$ (per-cent)	d_{ch}	Q^r_{CW} (cal/g)	C_{CD}/V	$(C/H)_{wt}$
V^r (percent)	1.0000	-0.8295	0.8148	0.8173	-0.7024	-0.7695	-0.7743	0.4809	-0.8326	-0.5751
C^r (percent)		1.0000	-0.7031	-0.7220	0.6467	0.7200	0.7044	-0.2925	0.7053	0.5810
H^r (percent)			1.0000	0.9724	-0.8303	-0.9466	-0.9695	0.8319	-0.7956	-0.8801
V_T^r (ml/g)				1.0000	-0.8644	-0.9421	-0.9752	0.8198	-0.8454	-0.8393
H_v (kg/mm^2)					1.0000	0.8483	0.8258	-0.6777	0.8011	0.6074
$\bar{R}_{max}$ (percent)						1.0000	0.9404	-0.7930	0.7879	0.8629
d_{ch}							1.0000	-0.8421	0.7935	0.9081
Q^r_{CW} (cal/g)								1.0000	-0.5549	-0.8158
C_{CD}/V									1.0000	0.5917
$(C/H)_{wt}$										1.0000

V^r, C, H^r, V_T^r (volatile matter volume on combustible basis), d_{ch}, $\bar{R}^o_{max}$, H_v, Q^r_{GW}, C_{GD}/V (fuel ratio), C/H (weight ratio). The results included the correlation coefficients among the indices, as shown in Table 3.

From Table 3, it can be seen that:

(1) The respective correlation coefficients between H^r and V_T^r, d_{ch}, $\bar{R}^o_{max}$, and between V_T^r and $\bar{R}^o_{max}$ are as high as 0.9724, - 0.9695, -0.9466, -0.9421, which indicates excellent consistency among the indices. Thus, H^r, V_T^r or $\bar{R}^o_{max}$, d_{ch} are all fairly good indices which can qualify the metamorphic grade of anthracite.

(2) The correlation coefficients between V^r and V_T^r, H^r, d_{ch}, $\bar{R}^o_{max}$, Q^r_{GW} are 0.8173, 0.8148, -0.7743, -0.7695, 0.4809 respectively, which goes to show that V^r is much more complicated than V_T^r. The consistency between V^r and $\bar{R}^o_{max}$, H^r, d_{ch} is relatively poor. Although it can qualify the metamorphic grade of coal to a very large extent, it is not as good as V_T^r, H^r, $\bar{R}^o_{max}$ and d_{ch}.

(3) As shown in the H^r - V^r relationship graph (Figure 2), with the exception of a few dots, all ore points are distributed within a comparatively narrow zone. If the dividing line between meagre coal and anthracite is set at V^r = 10 percent, it follows that $H^r \leqslant 4$ percent holds true for the overwhelming majority of anthracite. Many ore points, including China's largest reserves such as Yangquan, Zhijin, and medium reserves Riqigou, Furong, Songcao, as well as some well-known anthracite producing regions, are distributed within the range of V^r = 6 to 8 percent, H^r = 3.2 to 4 percent. Based on V^r and reflectivity indices, the coal quality [coal rank] of these mining areas can fundamentally meet the technical requirements of many chemical industries, such as chemical fertilizer producers, which use anthracitous coal. Setting the upper limit of anthracite at 9, 8 or 7 percent does not conform to the characteristics of our country's resources. The ore points in this area are so crowded together that it is impossible to divide them with any index (V^r, H^r or any other index) at all. In our opinion, it is better to use V^r = 10 percent as the line of division between anthracite and meagre coal, i.e., $V^r \leqslant 10$ percent for anthracite, and $V^r > 10$ percent for meagre coal. H^r = 4 percent corresponds to V^r = 10 percent. The values of the two indices computed from the regression equation coincide with one another. That is, $V^r = -1.2633 + 2.7964\ H^r$.

When H^r = 4 percent, V^r = 9.92 percent or approximately 10 percent.

Besides, in considering whether or not to use V_T^r for differentiating anthracite from meagre coal, it should be noted that based on the V_T^r - V^r relationship graph, V^r changes from 6 percent to 13 percent when V_T^r > 250 ml/g becomes 320 ml/g, which means that with only one index V_T^r, it is impossible to differentiate anthracite from meagre coal. Also, as to whether d_{ch} can be used to

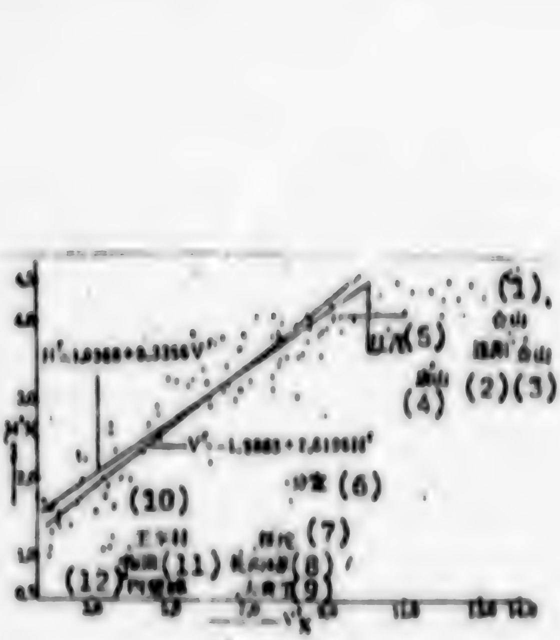

Figure 2. H^r - V^r Indices Relationship Graph

Key:

(1)	Heshan	(5)	Hongmao	(9)	Dawoli
(2)	Lianyang	(6)	Fenyi	(10)	Wangpingcun
(3)	Heshan	(7)	Yangtuo	(11)	Meitian
(4)	Kangshan	(8)	Changgouyu	(12)	Siwangzhang

differentiate anthracite from meagre coal, the d_{ch} - V^r relationship graph indicates that within the range of $V^r \leqslant 10$ percent, d_{ch} takes on remarkable changes and increases as V^r decreases. When $V^r = 10$ percent, $d_{ch} = 1.35$. This finding coincides with the results of foreign research. But within the range of meagre coal, d_{ch} no longer changes in great amplitudes when V^r exceeds 10 percent. Thus, when d_{ch} is equal to or slightly greater than 1.35, meagre coal is often erroneously classified as anthracite. It is quite obvious that d_{ch} cannot be used for differentiation purpose.

Among the various countries which have conducted research on using the reflectivity of specular coal as an index for coal classification, there is considerable inconsistency regarding R^o_{max}, the line of division between anthracite and meagre coal. In Czechoslovakia, R^o_{max} is set at 2.2; in the Soviet Union, it is 2.5; in France, it is 2.8; in the United States the reflectivity of semi-anthracite is 1.92 to 2.5, and the reflectivity of anthracite is > 2.5. In our country the line of division between anthracite and meagre coal is set at 2.5. This index coincides with the foreign research results.

(4) On the problem of subdividing anthracite: Our country has anthracite of relatively low metamorphic grade and characterized by $V^r \geqslant 6.5$ to 10 percent and $H^r \geqslant 3.2$ to 4 percent; it also has anthracite of medium metamorphic grade with V^r ranging from 3.5 to 6.5 percent and H^r ranging from 2.0 to 3.2 percent; and it also has anthracite of high metamorphic grade or containing partially natural coke with $V^r < 3.5$ percent and $H^r < 2.0$ percent. Each of the three preceding kinds of anthracite has its own unique properties. The requirements

for industrial utilization also vary. For instance, in our country today, low metamorphic grade anthracite with low ash and sulphur contents is usually used for blast furnace blowing. In the manufacturing of egg-shaped briquets using sodium humic acid as adhesive, striking improvements have been achieved in the intensity of briquets made of old anthracite. But the grindability and thermal stability of old anthracite are drastically damaged. As indicated above, it is quite necessary to divide anthracite into subgroups with the help of V^r and H^r. From the H^r - V^r relationship graph, it is clear, where $V^r \leqslant 10\%$, that some of the ore points (mainly in the coal districts Jingxi[western part of Beijing] and Siwangzhang) tend to deviate from the ordinary ore points. Such indices as H^r, V_T^r, R^o_{max} and d_{ch} indicate that the coals in these ore points bear the characteristics of anthracite with relatively high metamorphic grade. But their volatile matter content in weight is 2 to 6 percent higher than ordinary anthracite. It would be worthwhile to conduct further research and find out what causes this to happen. Striking improvements can be made if the correlation coefficients of V^r and H^r are recalculated after removing those samples from ore points with higher V^r deviations, i.e., when the correlation coefficient r = 0.9376, the regression equations become:

$$H^r = 1.0368 + 0.3356V^r$$

$$V^r = -1.9883 + 2.6196H^r$$

If H^r = 2.0 percent and H^r = 3.2 percent are used as division lines between subgroups, based on the preceding regression equations, the most suitable V^r should be 3.3 percent and 6.4 percent respectively. If V^r = 3.5 percent and V^r = 6.5 percent are used as division lines, the corresponding H^r should be 2.2 percent and 3.2 percent respectively.

In sum, we propose the following plan (Table 4) for the subdivision of anthracite.

Table 4. Plan for Classification of Anthracite

Coal Type	Symbol	V^r (percent)	H^r (percent)	Remarks
meagre coal	PM	>10.0 to 20.0	--	Bitumite of the highest metamorphic grade.
anthracite No 1	WY_1	> 6.5 to 10.0	>3.2 to 4.0	Anthracite of relatively low metamorphic grade.
anthracite No 2	WY_2	> 3.5 to 6.5	>2.0 to 3.2	Fairly typical anthracite.
anthracite No 3	WY_3	$\leqslant$ 3.5	$\leqslant$2.0	Anthracite of relatively high metamorphic grade.

There are two indices in the proposed plan, but only one index V^r is actually used in the classification of anthracite and meagre coal. Generally, V^r is used for subdividing anthracite; but H^r is used as the standard index when the V^r of anthracite tends to be high, and classification based on V^r and H^r leads to conflicting results.

3. Probing into anthracite classification by the cluster analysis method. In order to check the reliability of the preceding plan for the classification of anthracite, 127 coal samples were put to Q-type cluster analysis on the computer, using the values of V^r, H^r, V_T^r, d_{ch}, C^r, C_{GD}, Q_{QW}^r, $\bar{R}max^0$ and H_v; i.e., indices which could qualify metamorphic grade of coal. The result was output in a computer (two-dimensional genealogical) tree chart which vividly expressed the similarities (close/distant relationship) among the coal samples in terms of distance coefficients. From the result of cluster analysis, it was very clear that the coal samples could be grouped into four categories, i.e., PM, WY_3, WY_2 and WY_1. The consistency between the above finding and the classification based on a single index V^r in Table 4 is up to 82.7 percent, which indicated that the two classification methods are fundamentally consistent with each other.

III. Classification of Bituminous Coal

The classification of bituminous coal constitutes the main portion of coal classification as a whole. Both the International Hard Coal Classification and the various coal classification systems of foreign countries are based chiefly on bituminous coal classification. The indices for classification are generally those which can qualify metamorphic grade and caking property. Most countries use volatile matter content on combustible basis (V^r) as an index for qualifying metamorphic grade. From the viewpoint of development, it is better to use the reflectivity of specular coal. Following are indices for qualifying caking property: Roga Index (R.I.), Audibert-Arnu dilatation coefficient (b), Free Swelling Index (F.S.I.), Gray-King coke type (G.K.) and the maximum thickness of colloidal laminae (Y). Each country has its own set of indices and classification method based on its own conditions. The classification of coals should be combined with the characteristics of each country's coal resources. There is a general consistency among the coal classification systems of various countries; each has its own unique features.

1. Selection of classification indices--In the Research on bituminous coal classification, a great deal of effort has been put into the selection of classification indices. Improvements on the basis of the Roga Index has led to the introduction of the bituminous coal caking index ($G_{R.I.}$) as an index for qualifying the caking power of coal. It has better correlations with such indices as R.I., N, G.K. and Y (correlation coefficients range from 0.98 to 0.83). Through trend plane analysis of V^r - $G_{R.I.}$ combination, it has been discovered that $G_{R.I.}$ matches fairly well with the coke intensity in 200 Kg coking oven tests. The method of measuring this index is simple, wastes little coal samples; its reproducibility of the results of determination is excellent.

2. Subdividing classification indices by use of the optimum division method--134 bitumite samples were subjected to 200 Kilogram coking oven tests and laboratory tests, and the results were put to optimum division computation. First, the optimum division points were found on the basis of the metamorphic grades

of coal, and arranged according to the order of selected V^r values, i.e., volatile matter content on combustible basis. Besides, the following parameters were taken into account: maximum reflectivity of specular coal $\bar{R}_{max}$; the atomic ratio of hydrogen and carbon $(H/C)_{atomic}$, the maximum fluidity temperature in measuring the Gieseler fludity $(t_m)g$. For reference, the quality of coke was also taken into account (200 Kg coking oven test); e.g. the grindability of coke larger than 40 mm (M_{40}), resistivity to abrasion (M_{10}), ratio of powder coke less than 10 mm (F_{10}), and ratio of lump coke larger than 60 mm (Q_{60}). Altogether, eight indices were used for optimum division computation. The computation results indicated that when the number of subdivided classes $K > 4$, the optimum division points occurred throughout the entire V^r value ranges of 36.18 to 36.15 percent, 27.95 to 27.51 percent and 19.38 to 18.84 percent. The value of minimum error function E decreased whenever the number of subdivided classes increased. From the curve of E variation with R, 5 or 6 divisions could generally be classified in accordance with the metamorphic grade of coal, and thus enabled the change rate of the error function to become relatively small. V^r has 4 division point values which correspond to the 5 classified divisions: 36 percent, 28 percent, 19.5 percent and 17 percent. In view of the coal classification in our country, it may not be necessary to make further divisions when V^r is approximately 17 percent. For the sake of convenience in practical classification work, 3 division points were selected, i.e., V^r = 20, 28 and 36 percent (to gear the current classification to the actual conditions of China's young coal resources, the division point at V^r = 36 percent was shifted to 37 percent). Bituminous coals were divided into four categories: low-volatile coal, low/medium volatile coal, medium/high volatile coal and high volatile coal.

The optimum division method can also be used to grade the caking power of coal. Selected values of caking index $G_{R.I.}$ formed the basis of the order; such quality indices as coke intensity were used as reference, and other indices such as the maximum thickness of colloidal laminae (Y), caking power N, degree of dilatation (b), Gieseler maximum fluidity log a_{max}, M_{40}, M_{10}, Q_{60} and F_{10} were also taken into account. The computation results showed that the division points of $G_{R.I.}$ were 98, 89, 78, 62 and 39 respectively when K = 6. After properly arranging the division point values and taking 90, 75, 60 and 40 as the division points to classify the grades of bituminous caking, due to their consistent occurrence, it was then suggested that division points 75 and 40 should be regarded as the basis for classifying the major groups. Thus, bitumite was divided into strong caking coal, medium caking coal and weak caking coal. Strong caking coal and medium caking coal could be further subdivided into $G_{R.I.} > 90$ for exceedingly strong caking coal, $G_{R.I.}$ = 60 to 90 for medium/strong caking coal, and $G_{R.I.}$ = 40 to 60 for medium caking coal. As a portion of weak caking coal could not be assayed by the drum coking test, it was also necessary to subdivide weak caking coal by using the values of $G_{R.I.}$ as the order, and basing otpimum division on R.I., N, Y, log a_{max}, Q_{40} and F_{10}. The results of summing and sorting indicated that within the range of $G_{R.I.} < 40$, weak caking coal could be subdivided into $G_{R.I.}$ = 0 to 5 for noncaking coal, $G_{R.I.}$ = 5 to 20 for slight caking coal, and $G_{R.I.}$ = 20 to 40 for weak caking coal.

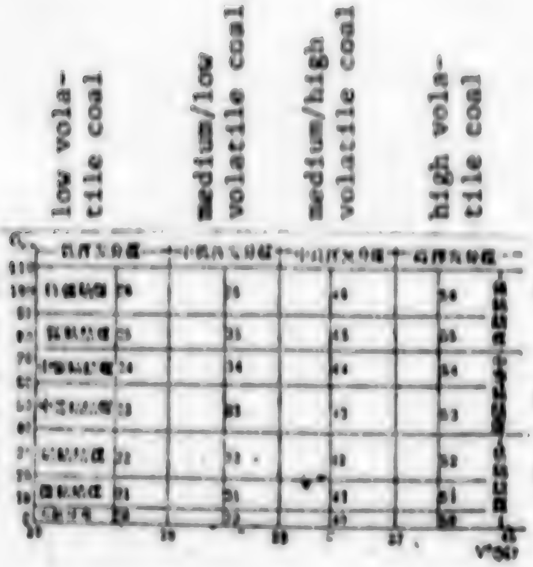

Figure 3. Results of Optimum Division of Bitumite $V^r - G_{R.I.}$ Values

In sum, bituminous coal can be divided into 16 (or 28) small boxes (as shown in Figure 3) according to metamorphic grade and caking property. The International Standard Organization's classification coding system is recommended for the nomenclature of each kind of coal. Each box is represented by a two-digit code number. The first digit indicates the metamorphic grade (V^r), and the V^r value of the anthracite stage is set at 1. For bituminous coals with V^r > 10 to 20 percent, the first digit is 2; for V^r > 20 to 28 percent, it is 3; for V^r > 28 to 37 percent, it is 4; and when V^r > 37 percent, it becomes 5. The last digit indicates the grade of caking property. For noncaking coal, the last digit is set at 0, and caking property is graded in the order of 1, 2, 3, 4, 5 and 6. The formulation of a natural classification system which can qualify the natural features and technological properties of coal provides the basis for the technological and technical classification of bitumite.

3. Suggestions for the technical classification of bitumite: Quite a sizable portion of bitumite is used in coking technology. The most basic requirement for coking coal is that the denotations by classification indices should be consistent with the results of coking oven tests. Specifically, the division of coals by type should be such that there is only a minimal difference of coking property among coals of the same category, but the greatest possible difference of mean coking property among different types of coals, so as to classify coals by type and compare different classification plans. For this purpose, cluster, analyses and discriminant analyses have been performed on the test results of coal samples used for coal classification. The distance coefficient method was used in the cluster computation of coke qualities (M_{40}, M_{10}, Q_{60}, F_{10}) obtained from 200 Kg coking oven tests of n = 134 samples. The computed coal

categories were plotted on the V^F - $G_{R.I.}$ graph according to the location of each coal sample, and the coals were roughly divided into five classes. Although there was some overlapping among certain categories, the quality indices, such as coke intensity, were clearly manifest and basically met the minimum requirements on the classification coding of coals used for coking.

As compared with the current classification system, the main difference in the new plan for technical classification of bitumite (Figure 4) lies in the addition of a new class: subcoking coal. The new scheme is characterized by relatively strong emphasis on the properties of each category of coal, which means that the coking technological properties of coals within the same category are somewhat similar; but for coals of different categories, there are relatively great differences between their properties. The gaps between the mean values of indices M_{40}, M_{10} and F_{10} of each category of coal in the new classification plan are greater than those in the original plan. The standard difference between fat and lean coals in the new classification plan is largely improved. As the incorporation of fat coal into gas coal can cause fairly large fluctuations to occur in the M_{40} index of gas coal, gas coal will thus be classified as an independent category in the new classification plan.

Figure 4. Proposed Plan for Technical Classification of Bituminous Coal

FM = fat coal JM = coking coal SM = lean coal PM = meagre coal
FQ = fat gas coal YJ = subcoking coal RN = weak caking coal BN = noncaking coal
CY = candle coal

IV. Concluding Remarks

The systematic research on the classification of coal in our country has resulted in the proposal of a draft plan for China's national standard coal classification (see Figure 5 and Table 5).

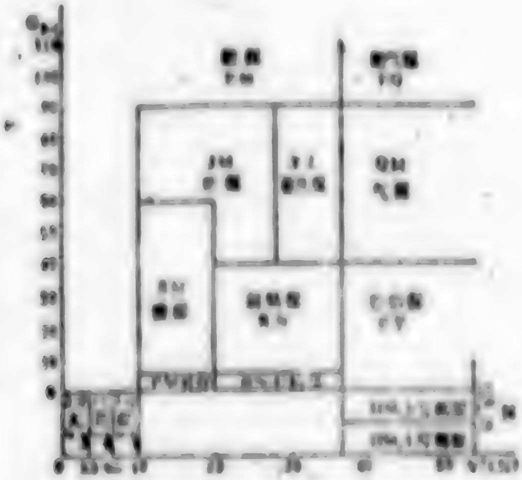

Figure 5. China's National Standard Coal Classification (Draft)

(1) Y = 25 mm is the division line which distinguishes fat coal and fat gas coal from coking coal, subcoking coal and gas coal; is Y comes into conflict with classification by $G_{R.I.}$, then Y is regarded as the standard.

(2) V^r is the classification index of anthracite; if V^r and H^r contradict each other, then the classification is based on H^r.

WY_3 ($H^r \leq 2.0$), WY_2 ($H^r > 2.0$--3.2), WY_1 ($H^r > 3.2$--4.0)

FM = fat coal	PM = meagre coal
FQ = fat gas coal	BN = noncaking coal
JM = coking coal	WY_1 = anthracite No 1
YJ - subcoking coal	WY_2 = anthracite No 2
QM = gas coal	WY_3 = anthracite No
SM = lean coal	HM_1 = lignite No 1
RM = weaking caking coal	HM_2 = lignite No 2
CY = candle coal	

(1) The transmissibility (P^M) of the visual method is used as an index for classifying lignite and bitumite; i.e., $P^M > 66$ percent for bitumite, $P^M \leq 66$ percent for lignite. Lignite is subdivided at $P^M = 30$ percent; i.e., $P^M < 30$ percent for No 1 lignite and $P^M \geq 30$ to 66 percent for No 2 lignite.

Table 5 China's National Standard Coal Classification (proposed draft)

Coal Type (1)	Symbol	V^r (percent)	$G_{R.I.}$	Auxiliary Indices: P^M (percent)	Auxiliary Indices: H^r (percent)	Auxiliary Indices: Y (mm)
anthracite No 3 (2)	WY_3	≤3.5			≤2.0	
anthracite No 2	WY_2	>3.5--6.5			>2.0--3.2	
anthracite No 1	WY_1	>6.5--10			>3.2--4.0	
meagre coal	PM	>10--20	≤5			
lean coal	SM	<20	>5--60			
coking coal	JM	<20 20--28	>60--90 >40--90			
subcoking coal	YJ	>28--37	>40--90			
weak caking coal	RN	>20--37	> 5--40			
noncaking coal	BN	>20--37	≤ 5			
fat coal	FM	≤37	>90			>25 basis(3)
fat gas coal	FQ	>37	>90			>25 basis (4)
gas coal	QM	>37	>40--90			
candle coal	CY	>37	40--0	>66		
lignite No 2	HM_2	>37	—	≤66--30		
lignite No 1	HM_1	>37	—	<30		

Notes: (1) Sample for classification should be either cleaned coal prepared with heavy fluids of -1.4 specific gravity or raw coal with less than 10 percent ash content; (2) If contradictions arise in the classification of the three kinds of anthracitous coals by V^r and H^r, then H^r should be regarded as the criterion. (3) If Y≤25 mm, it should be classified as subcoking coal or coking coal depending on the magnitude of V^r; (4) If Y≤25 mm, it should be classified as gas coal class.

(2) In the classification of various type of bituminous coals, V^r is used as an index for qualifying the metamorphic grade of coal, and $G_{R.I.}$ is an index for qualifying the caking property of coal. To classify very strong caking coals whose $G_{R.I.} > 90$, the maximum thickness of colloidal laminae Y and Audibert-Arnu dilatation coefficient b are used as auxiliary indices. Coals with $G_{R.I.} > 90$ and Y > 25 mm are classified under the fat coal category.

(3) The division line between anthracite and bitumite is still set at V^r 10 percent, i.e., $V^r \leqslant 10$ percent for anthracite, and $V^r > 10$ percent for bitumite. Anthracite is subdivided at V^r 3.5 percent and 6.5 percent, i.e., $V^r \leqslant 3.5$ percent for No 3 anthracite, $V^r > 3.5$ to 6.5 percent for No 2 anthracite, $V^r > 6.5$ to 10 percent for No 1 anthracite (3 subclasses).

(4) The proposed draft for China's national standard coal classification divides our country's coals into 15 classes which include 2 lignite classes, 3 anthracite classes, 10 bitumite classes (gas coal, fat gas coal, fat coal, subcoking coal, coking coal, lean coal, noncaking coal, weak caking coal, candle coal and meagre coal).

(5) The advantages of the preceding proposed classification draft are as follows: The classification indices in the draft are simple and easy to use, accurate and reliable, economical in the use of coal sample, and easy to popularize. All of the coal classes are classified on the basis of numerous tests and extensive study. Coals of the same class are relatively similar in property, and the classification of the classes is quite reasonable. Due attention is given to the continuity between the new and original classification plans; with the exception of the addition of a new category, there are not many changes in the other types of coals as compared with the original classification plan. The draft plan conforms fairly well to the specific conditions of our country.

(6) Following are some problems in the new draft of coal classification which remain to be further studied and solved:

(a) Corresponding standards should be established for the various kinds of analyses and tests involved in classification work, e.g., caking property index $G_{R.I.}$, visual transmissibility P^M, etc. The anthracite samples used for $G_{R.I.}$ index should likewise be standardized.

(b) In view of the influence of ash contents in coal samples (especially coals which rank below the medium caking grade) on the measurements values of $G_{R.I.}$ index, it is imperative to set strict requirements on the methods used for crushing, cleaning and selecting coal samples so as to attain consistency of results obtained from multiple tests in the same laboratory as well as tests conducted in different laboratories, and thus reduce the discrepancies which arise in the determination of coal ranks.

(c) As coal classification involves various sectors of the national economy, there should be a certain degree of continuity between the new and old plans. It is advisable to implement the new plan on a trial basis for a relatively long period of time. Information on problems arising in the course of trial implementation should be gathered so as to facilitate the gradual improvement and eventual perfection of the classification plan.

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ENERGY

OUTLOOK FOR COAL-BURNING SHIPS DESCRIBED

Beijing CHUANBO SHIJIE [SHIP WORLD] in Chinese No 23, 1 Dec 80 p 7

[Article by Xian Ping [2009 1627]: "The Outlook for Coal-Burning Ships"]

[Text] Because of the rise of oil prices and the unreliability of oil supply, the use of coal in place of oil as a substitute energy source is now receiving worldwide attention.

There are huge coal deposits. According to an estimate, there are 10 trillion tons of coal deposits of which 590 billion tons have been verified. The majority of these deposits are located in the northern hemisphere and particularly concentrated in the United States, the Soviet Union and our country. The geographical distribution of coal deposits is different from that of oil.

In a summit meeting of certain countries held in Tokyo in 1979, the substitution of coal for oil as an energy resource was discussed and the participants were unanimous in the following respects:

1. Maximum use of coal as fuel in the electric power section of industry.

2. Improvement of coal transportation facilities.

3. Increase of investments in coal mining.

4. Promotion of the stability of the coal trade.

5. Maintaining coal production at a certain level in various countries.

Thus we can anticipate a sharp increase in the volume of coal trade. According to a report by the economic research center under the Ministry of Transportation in Japan, the volume of coal trade in the world in 1976 was 29.6 million tons; and by 1990, the volume will be increased to 180 million tons, or 6 times that of 1976. During this period, Japan alone will import 53.5 million tons. Coal transportation ships will have to be correspondingly increased to accomplish this gigantic task.

The Ministry of Transportation of Japan has compared the consumption of coal with the consumption of oil by a 120,000-ton coal carrier on the Japan-Australia run, and the conclusion showed that the transportation cost was 40 percent lower when coal was used as fuel. Therefore, although the cost of building a coal-burning ship is at least 20 percent higher, this additional outlay can be recovered in 5 years because of the lower transportation cost.

However, the gains for other merchant ships not engaged in coal transportation are not so obvious. For coal transporting ships, it would be best for the ports at both ends to serve as coal export centers, and the routes should not be too long; otherwise, it would be necessary for the ship to take on additional coal enroute. Furthermore, since coal can produce only 65 percent of the heat produced by the same quantity of oil, the space for coal storage and the boilers used should be twice those required for oil-burning ships. This will reduce the payload carried.

There are still many problems with coal-burning ships at present, such as the boiler models, the type of coal to be used, fuel control, ash disposal, the reliability of coal conveyors, and pollution aboard the ship. These problems need further study.

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BRIEFS

SHANXI COAL--The Shanxi Provincial Coalfield Geology Exploration Company made three reports last year confirming the discovery of a total of 1.66 billion tons of exploitable coal in Shanxi. This is one-third of all the coal discovered in China last year, and is sufficient for 160 years of mining 10 million tons of raw coal per year. [Excerpt] [Beijing RENMIN RIBAO in Chinese 16 Jan 81 p 1]

TIANJIN INDUSTRIAL ENERGY SAVINGS--Energy consumption per 10,000 yuan of output value in Tianjin's industrial system was 9.6 percent lower last year than in 1979, an energy savings equivalent to 700,000 tons of standard coal. [Beijing RENMIN RIBAO in Chinese 16 Jan 81 p 1]

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INDUSTRY

INTEGRATION OF LIGHT, HEAVY INDUSTRIES CONSIDERED FEASIBLE

Shanghai WEN HUI BAO in Chinese 29 Oct 80 p 1

["Work Research" column article by WEN HUI BAO correspondent Le Fu [2867 1133]: "Light and Heavy Industrial Plants Can Also Take the Road of Integration"]

[Text] Our municipal industry has achieved remarkable success in taking the road of integration while implementing the policy of national economic readjustment. For more than 1 year, 166 collectively owned enterprises in the municipality have broken through the barriers between different regions and different systems of ownership and promoted the production of urgently needed items for national construction and the people's livelihood through integration or joint undertakings. Yet among the many integrated plants, there is no integration or joint undertaking between plants of the two industrial bureaus. Why?

In readjusting the national economy, the imbalance between light and heavy industries must be changed. In our city, light industry and the textile and handicraft trades are shouldering a heavy responsibility in production. Despite their fairly rapidly increased production, these trades are still unable to fully meet the demands at home and abroad. On the other hand, in some branches of heavy industry, many plants are not assigned sufficient production tasks. Let us take the First Machinery and Power Bureau as an example. In 1980, although many plants in this sector tried every possible way to look for jobs, the total output value of the bureau was still less than that of 1979, and, according to a preliminary estimate, it will be even less in 1981. Of course, the plants under the First Machinery and Power Bureau will continue to look for jobs, and some of these plants will undertake the production of light industrial goods. If further action is taken to smash the barrier between the light and the heavy industrial sectors so that machinery and power plants will be free to integrate with some light industrial plants, to help the latter repair machines and carry out technical transformation, or to change to the production of light industrial goods, isn't this a good way to accelerate the development of light industry and to solve the problems of some machinery and power plants now operating under capacity? As we understand, the heavy production task now confronting our light industry bureau and the slow increase in the production of sewing machines have made it necessary for the garment trade to import industrial sewing machines from abroad. If the integration of light and heavy industrial plants is carried out, production of these goods can be more rapidly developed.

For many years, all branches of industry in Shanghai have developed simultaneously with the result that our business section in the city, measuring 141 square kilometers, has become overcrowded. If the light industry wants to make any headway after implementing the policy of national economic readjustment, it has to tap potentials inside the enterprises and carry out integration and internal readjustments within the trades with these methods: First, it must take additional measures some of which call for house building and heavy outlay on what are actually capital construction projects. Secondly, new plants should be built in various districts and counties. Thirdly, integration has to be formed with the suburban counties where land and labor power are available for the light industry. Even though these expedients may help maintain a continuous rise of the ratio of light industrial output value in the total industrial output value of this city, it will still cause congestion in the city's industrial layout. Therefore, if our light industry is to continue its rapid development, we should give thoughts to the question of integration between light and heavy industrial plants and change the structure of our light and heavy industries. In the past, our city allotted 97 light industrial plants and textile mills, 1.19 million square meters of factory buildings and a huge labor force to help develop the machinery and power, the electronic, and the instrument and meter industries. Then why can't some heavy industrial plants and national defense industrial plants now operating under capacity change to the production of light industrial goods?

How can we promote the development of our various industrial bureaus and their affiliated plants through integration? Here, in addition to a recognition by the leaders of individual plants of the need for integration, the leaders of the departments in charge have also to do a lot of promotional work. For a long time, because of the existing systems of leadership and planning, the departments in charge have only been concerned with their own products, output value and profits, and have imposed rigid demands on the basic level enterprises as to what to produce and how much to produce. Any proposed change of the orientation of production must be submitted to the authorities above, level by level up to the central authorities concerned, before any decision can be made. Now, if we recognize the relative independence and rights of the enterprises and advocate the integration between these enterprises, it is necessary for the departments in charge to overcome the "leftist" ideas and to get rid of the outdated concepts. If any bureau thinks that its affiliated enterprises being integrated with those affiliated to another industrial bureau would get out of its sphere of control, or that the integration would mean the "swallowing" of its affiliated enterprises by another bureau sooner or later, and therefore lose interest in, or even hinder the integration under various pretexts, these enterprises are actually treated as appendages to the departments in charge. Solution of new problems with old concepts will not help the development of integration. It is my opinion that every comrade of the industrial departments in charge should study this problem, clearly recognize the need for the restructuring of economic management, and allow the road of integration in our city to become ever broader!

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INDUSTRY

MERITS OF DEVELOPING LIGHT INDUSTRY DESCRIBED

Jinan DAZHONG RIBAO in Chinese 4 Dec 80 p 1

[Article by DAZHONG RIBAO correspondents Yang Ping [2254 1627] and Tong Kao [0681 5072]: "Actively Develop the Strong Points To Increase Production and Income"]

[Text] Jinan--The first light industry bureau of Jinan has adopted effective measures to bring strong points into play and to foster strength and circumvent weaknesses, and thus promoted the rapid growth of light industry. By 24 November, the first light industrial sector in the municipality fulfilled its production plan 37 days ahead of schedule with a profit of more than 50 million yuan, or an increase of 44 percent over the same period of 1979.

Since the beginning of 1980, the first light industry bureau of Jinan, in an effort to enliven production and management, has strengthened the system of directing production from the bureau down to the basic levels. It has set up and improved the systems of operation, analysis and inspection, conscientiously consolidated the enterprises, streamlined various basic tasks, and gained the initiative in maintaining a sustained growth of production, thus insuring an increase of production through the practice of economy and an increase of income along with the increase of production. Many basic level enterprises have also greatly increased the output of seasonal goods or industrial goods for daily use which are in short supply, according to the seasonal and market demands. The production of cigarettes with filter tips was increased seven-fold; the production of typewriter and sewing machine screws was trebled; and the output of bicycles, paper with designs and decorative paper was more than doubled.

In developing light industry and increasing both output and income, the first light industry bureau of Jinan Municipality has focused its attention on producing goods in short supply or out of supply, and tried every way to improve the product's quality, to trial produce new items, and to increase the designs and varieties. Since the beginning of 1980, this bureau has launched a campaign for excellent quality and brand-name products by strengthening the scientific management of enterprises. The amount of fine-quality goods produced exceeded that of last year by 65 percent. For these products, the bureau won good-quality medals awarded by the state. The varieties of fine-quality goods produced by the light industrial sector and the first light industry bureau of the province also exceeded those of 1979. Through an overall quality control, the Municipal Light

Industrial and Chemical Product Plant has produced Jiali Toilet Soap, Jinniu Soap, Huaguang Soap and special glycerine, all of which are rated as fine quality goods of the light industrial sector in the province. While improving the quality of their products, many light industrial enterprises have stepped up their efforts in introducing new products and new designs. In the past 10 or more months, the light industrial sector in Jinan successfully trial manufactured 51 types of new products and produced 36 new designs and new items. The Jinan Paper Mill used pulp from wheat stalks in trial producing cigarette filter tips. After repeated experiments by the plant's own scientific research center, the crucial problems of color and density were solved, thus saving the use of imported pulp wood and lowering the production cost. The quality of these filter tips can match those of similar products produced at home and abroad. These filter tips are now in serial production and are paving the way for the production of filter-tipped cigarettes. The aluminum foil, paper designs which can be transferred on to cloth, the 24-inch bicycles, the 50A and 50B motorcycles and other new products which have been successfully trial manufactured have all reached a fairly high level. As for designs, the compound tube toothpaste, TV tubes, imitation porcelain cups with lids, thermoscups and so forth are also well received.

In striving for increased output and increased income, the first light industrial sector of Jinan has also paid attention to the role of market regulation under state planning guidance. Many light industrial enterprises have strengthened their sales forces and set up special organs for propaganda and sales promotion in various forms, besides greatly increasing the number of their sales agencies, consignment centers, and exhibition and retail departments. They also actively participated in various exhibition and sales meetings and meetings for placing orders held in different localities in an effort to enliven their business operations. Since the beginning of 1980, the first light industrial sector of Jinan has increased its output value by more than 90 million yuan, or 17 percent of the total output value, through utilization of the regulative role of market. Through more active market investigation and market forecast, these enterprises have organized their production according to market demands and sold many previously unwanted goods, besides strengthening their competitive powers. The sale of cigarettes, foodstuff, cooking utensils and light bulbs has greatly increased. The sewing machine screws produced by Jinan Sewing Machine Screw Plant are enjoying brisk sales at home and abroad. This plant fulfilled its profit and output quotas for the current year 5 and 4 months ahead of schedule respectively, and complete plans have been worked out for the next year's production.

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INDUSTRY

HEAVY INDUSTRY URGED TO GIVE FACTORY BUILDINGS TO LIGHT INDUSTRY

Shanghai WEN HUI BAO in Chinese 5 Dec 80 p 1

[A suggestion from WEN HUI BAO correspondents: "Heavy Industry Is Requested To Transfer Some Factory Buildings to Light Industry in Implementing the National Economic Readjustment Plan and in Developing Shanghai's Light Industry"]

> [Text] Our correspondents Zhang Yongkang [1728 3057 1660] and Yang Zhenji [2799 2182 1015] have written to our editorial department suggesting that in implementing the policy of readjustment the leading departments should adopt special measures for adjusting surplus and shortage in solving the problem of severe shortage of factory space in Shanghai's light industry and in insuring its sustained growth.

Shanghai now wants to actively promote light industrial production. However, since the share of capital construction investments allotted to the units under the municipal light industry bureau in the past 20 years was very small, their plant premises are now in very poor shape, and the production sites are seriously overcrowded. The total floor space of all the plants under this bureau now amounts to only 3.4 million square meters. Approximately 70 percent of these buildings have been in existence since the pre-liberation days, and some 220,000 square meters of them are considered dangerous buildings. The Shanghai Watch Plant, for a long time known as one of the "biggest sources of income" was converted from a cigarette plant in 1960. Since then, its output of watches has increased from 450,000 to 4.33 million, and during these 20 years, the plant handed over to the state 2.6 billion yuan of accumulation funds; but the plant space has not been increased at all. The former basketball ground and table-tennis room have been converted into production sites and the library has now become a wooden model room. The child-care center has been squeezed into a warehouse, and 54 attics were built inside the plant buildings for storage purposes. Congestion in these places is beyond description. The buildings of the Second Shanghai Sewing Machine Plant, which produces a million "Butterfly" Sewing Machines annually, is like a combination of odds and ends. There are sand-mixing workshops at both ends, and in the central portion which serves as the main factory site, 73 families have set up their homes. Although the government has already approved its removal, no one can tell when the land and houses will be available. The Third Shanghai Bicycle Plant, which produces Fonghuang Bicycles, and the First Shanghai Sewing Machine Plant, which produces Feiren Sewing Machines, are unable to expand their

business because of the shortage of space. Worse still, the noise created and the three wastes are now assuming serious proportions. The small factories in the lanes and alleys are even worse off, because, instead of having any place of amusement and entertainment, they have even had to convert their mess halls and nurseries into work sites.

While economic restructuring is going on, the state certainly cannot afford to spend more money in building new factories for light industry. To eliminate the present imbalance by developing light industry, the most practical measure is to make up the shortage with the surplus in dealing with the factory space problem. The situation of factory space in Shanghai now is characterized by not only scarcity but also uneven distribution. The factory buildings of heavy industry are generally more spacious. Since some of these plants have been operating under capacity in recent years, the utilization rate of these buildings has become even lower. Because of its high productive capacity, the city's farm machinery bureau is leaving many buildings or workshops unused. Isn't it a pity for these buildings to be wasted? To promote the development of light industry, the State Council has reiterated the need to adopt forceful and special measures; yet the leading departments concerned have not positively responded by allotting some factory space to help the light industry meet its urgent needs. People simply have to let good opportunities slip by and can do nothing about it!

There are many ways to make up shortage with surplus in handling the factory space problem. The principal ones are as follows: (1) The surplus factory buildings of the municipal heavy industry, the farm machinery industry and the farm bureau can be used to support light industry. (2) In recent years, some capital construction projects have been halted in the process of readjustment. Among these unfinished projects, there are more than 600,000 square meters of factory buildings. Steps should be considered for part of these buildings to be used to solve the serious problem of building shortage. Furthermore, these buildings can be either rented out (and the rentals and terms of the lease can be stipulated in the agreement), or exchanges (that is, the exchange of factory buildings or workshops between both parties). Also investments can be diverted, or one party can transfer its surplus buildings to another party and these buildings will be returned to their original owner when the other party has built its own new factory. Another alternative is the method of integration (because economic integration can be formed among heavy industry, light industry and farm machinery industry).

The adjustment of surplus and shortage of factory buildings is entirely consistent with the principle of taking readjustment as the central task and has many advantages: First, it reduces or basically eliminates expenses. Secondly, it saves the trouble of land requisitioning. Thirdly, it saves a lot of building materials and construction labor. Fourthly, commissioning can be must earlier and immediate benefits can be expected. How can we afford to overlook all these advantages.

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INDUSTRY

EXPANDED DECISIONMAKING POWER SHOULD FOCUS ON ENTERPRISES

Shanghai WEN HUI BAO in Chinese 5 Dec 80 p 1

[Commentary by WEN HUI BAO correspondent Hu Bing [5170 0393]: "As Proved by the Experiences of Shanghai's Light Industrial Sector Over Many Years, Expanded Decision-Making Power for Companies as Separate Units Has More Defects Than Merits--Enterprises Must Have Independence and Expanded Power Before Its Initiative in Production Can Be Fully Displayed"]

[Text] In 1980, experiments in expanding the power of decision-making for the municipal industrial and communications sector have shown one special feature: the shift of expanded power from individual enterprises to individual companies. Is this a good arrangement? Experiences of Shanghai's light industrial sector in more than 1 year have proved that this form of expanded power, aside from facilitiating financial accounting and evening up the benefits or losses brought about by pricing among different enterprises, has many defects. The leaderships of many enterprises are of the opinion that the expansion of decision-making power should focus on the basic level enterprises.

There were 21 plants under the municipal light industry bureau in 1979, and two companies were given expanded power of decision-making. In 1980, as demanded by the departments concerned, the experiment of expanded power will be extended to five companies. There are several defects in the expansion of power for companies as separate units.

First, it cannot help but arouse the enterprises' enthusiasm and is apt to create the spectacle of all enterprises "eating out of the same pot." When the expanded power had been shifted to the companies, the enterprises lost their independence and were left powerless. This particularly affected those enterprises belonging to the companies newly acquiring expanded power this year, because whatever these enterprises had gained from their own expanded power and from the economic restructuring was again lost. This dampens their enthusiasm in production. Last year, experiments of expanded power of decision-making were carried out on the Shanghai Duplicating Machine Plant, and this plant's fund for developing production was increased by 230,000 yuan, thanks to the sharing of profits, while the bonus fund for workers and staff members, after paying each person an average of more than 180 yuan, still left a surplus. However, in 1980, following the transfer of the expanded power to the companies, this plant's fund for developing production

totaling 260,000 yuan was placed at the disposal of the company. Instead of reaping any benefits from its increased production, this enterprise had to reduce its bonus fund by about 17 percent, because the bonus funds of all enterprises affiliated with the same company had to be maintained at a certain level. Since the success or failure of the company does not directly affect the plants, many enterprises have returned to the old way of paying no attention to the quality of work, thus hindering competition among the enterprises.

Another defect in the expansion of power for companies is that it can easily breed bureaucracy. The overconcentration of power for companies makes it necessary for many issues, which can be easily handled by the enterprises themselves, to be held in suspense pending the company's examination and comments. For example, if an enterprise wants to appropriate money for the bonus fund or for paying overtime wages, it must first obtain the approval of the labor wage department; otherwise the bank will not issue the money. Again, if an enterprise wants to solve the problem of material shortage by making use of what they have produced over and above the production quota, it must first obtain the concurrence of the planning and the supply departments. The enterprises cannot independently handle external affairs because such affairs are under the company's jurisdiction. Even in building a toilet or a shed, repeated applications and approvals are required. At present, there are at least a dozen units affiliated with one company, and in production, many units do not have relations among themselves. Under the Rihua Company, for example, there are different trades producing matches, spices, soaps, battery cells, detergents, mosquito-repellent incense, and so forth. In view of their diversified character, they must have numerous problems, the solution of which would be a formidable task for the company no matter how efficient this company may be. Furthermore, when red tape is involved, precious opportunities can be easily lost.

Thirdly, the expansion of decision-making power for the company does not help in economic restructuring. Enterprises are the foundation of social productive forces, and the expansion of decision-making power for the enterprises is the central link in economic restructuring. It must not be overlooked that the present companies, though operating under the signboard of enterprise companies, are actually administrative organs with no economic responsibility. The expansion of power for companies is in fact the expansion of power for the administrative organs and this, in effect, turns the enterprises, which form a highly flexible economic apparatus, into an appendage of an administrative organ. This is incompatible with the objective requirements of economic development.

Fourthly, the resources of enterprises are now overtaxed and a period of recuperation is necessary. This is particularly true of the light industry which has long been neglected and is now in an "abnormal situation." If we do not pay any attention to the improvement of this "foundation," there will be a serious threat to the development of production. However, after the expansion of power for the companies, many of these companies have resorted to the tactics of equalitarianism and transfer by pooling the enterprises' development funds to be used on the transformation of certain trades regardless of the need to even things up within the individual enterprises. This method is not much different from that of capital construction investment, because it can only benefit a few enterprises while the majority of them cannot be transformed.

On the other hand, expansion of power for the enterprises will present a striking difference. Since the expansion of decision-making power was introduced, the Shanghai Sewing Machine Accessory Plant has witnessed such expansion in two different forms: expansion of power for the companies and expansion of power for the enterprises. In 1979, when experiments were carried out for the expansion of power for the companies, and with power concentrated in the hands of companies, this enterprise lost its innate drive and could not fully display its initiative in production. In 1980, when this plant became affiliated with the timber company and was in a position to experiment with the expansion of power independently, its economic responsibility was combined with its economic results and economic benefits, and the leading cadres, technicians and workers fully displayed their wisdom and ingenuity in trying to improve the operation and management of the enterprise. To earn more income for the state, the enterprise and the workers and staff members themselves, this plant revised its production targets three times in 1980 and helped maintain the continual growth of production. According to the stipulations of proft sharing, the bonus fund for the workers and staff members alone increase 60 percent over 1979. Judging from the present situation in the light industrial sector, we can see that expansion of power for the enterprises instead of the company yields better economic results. In 1979, the profits realized by 21 enterprises with expanded power under the light industry bureau showed an average increase of 21.8 percent, while the increase of profits for the five companies with newly acquired expanded power averaged only about 8 percent. Profit is the financial source for units with expanded power. Since enterprises with expanded power are financially independent, their funds for production, fringe benefits and bonus generally exceed those of companies with expanded power. This is highly beneficial to the enterprises in tapping potentials, in remolding and transforming their equipment, and in increasing the fringe benefits for the workers and staff members. Furthermore, the enterprises carrying out experiments of expanded power independently now can use their own initiative within the scope of expanded power in transforming themselves and in deciding on certain important issues. Therefore, democratic management and all types of basic work can be strengthened in the enterprises. The broad masses of workers and staff members whose destiny is now linked with that of the enterprise, will be concerned with every minute detail, look for discrepancies, propose measures, and conscientiously work out plans for the development of the enterprises. Some plants even practice the system of democratic evaluation and election of cadres, and thereby help raise the leading cadres' managerial ability.

From the above, we can see that expansion of decision-making power should be carried out in the basic level enterprises. Only thus can we enliven the economy and promote the production of enterprises. As for the companies having already acquired expanded power, we should first arouse the enthusiasm of the enterprises by practicing the method of two-level accounting and two-level power distribution with the plants playing the leading role, and delegating more power to the basic levels. To avoid the practice of equalitarianism and transfer and to make maximum use of the funds of different trades for the transformation of some enterprises, mutual economic assistance can be arranged in the form of loans among the member enterprises of a company. Those companies which are not organized on the basis innate economic relations should carry out readjustment and reorganization according to the principles of specialization in order to make further progress on the existing foundation.

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